E683-A
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MISSOURI DEPARTMENT OF TRANSPORTATION
THREE SECTION FLEXIBLE 15' or 10' CUT ROTARY MOWER SPECIFICATIONS

GENERAL - The intent and purpose of this specification is to establish minimum quality, safety and performance standards for heavy-duty tow type, P.T.O. driven hinged three-section rotary mower providing an optional cutting swath of 10' or 15' without evidence of streaking. The intent and purpose of this specification is also to describe a mower with engineering and design that will assure trouble-free Highway right-of-way mowing with a minimum amount of down time. Parts and service availability must be within 24 hour of contact.

DRIVE - The mower shall be gear driven with power transmitted directly from tractor P.T.O. to a heavy duty power divider gearbox located on mower center section which will transmit power to secondary gear boxes located on mower wing sections. The output shafts of primary and secondary gearboxes shall be the spindles for the blade carrier assemblies. The tractor yoke of the main drive shaft shall have a spring tension lock coupler with three ball yoke for quick attachment to the to the tractor RPM P.T.O. output shaft. Yoke connector at the splitter gearbox shall be an interference bolt type. Quick connector yoke at splitter gearbox is not acceptable. Drivelines will have a one-year complete warranty. A copy of the warranty must be included in your bid. Bondioli and Pavesi drivelines are required.

GEAR BOX ASSEMBLIES - Gears shall be of forged heat-treated steel running on lubricated bearings, completely enclosed in malleable or steel housing. Gearboxes shall be reinforced base mounted type. Gearbox bolts must have the capability of being retightened from the topside. All lubrication areas will be of easy access. Gearboxes will have a five-year pro-rated warranty. A copy of the warranty must be included in your bid. Bondioli and Pavesi gearboxes are required.

PRIMARY GEAR BOX - The primary power divider gearbox shall be the manufacturers premium model; engineered, rates and listed a minimum 200 HP by the gearbox manufacturer in their standard engineer/sales data. The divider gearbox will evenly divide the input power between three output shafts to power three individual and separate spindle gearboxes.

SECONDARY GEAR BOX - The secondary or wing gearboxes shall be the manufacturers premium model; engineered, rates and listed a minimum have a rating minimum of 160 HP by the gearbox manufacturer in their standard engineer/sales data. Secondary gearboxes shall all be the same, except for the direction of rotation.

BLADE ROTATION - As viewed from above the deck, facing the tractor, the left wing and center section shall turn clockwise and the right wing shall turn counterclockwise.

DRIVE LINES AND U-JOINTS - Heavy-duty self adjusting and telescopic drive shafts with main drive shaft to be of a 80° constant velocity type and U-Joints will be not less than 44R size and type (ASAE Category 6, 80 HP at 540 RPM). An optional Equal Angle Hitch non-constant velocity drive may be substituted in lieu of the 80degree CV drive. This Equal Angle hitch shall have a Weasler main power shaft in lieu of the Bondioli and shall be u-joint style verses CV style shaft requiring greasing once every 40 hours. This Equal Angle Hitch cannot be a jackshaft style with steady bearing. A decal shall be attached to the towing tongue detailing correct hitch placement and driveline attachment dimensions as per SAE Standard J1170, Rear Power Take-Off for Agriculture Tractors. All U-Joints will be equipped with neoprene seals and needle bearings. Drivelines and U-Joints shall automatically compensate for angles as wings are raised or lowered. P.T.O. drivelines and wing drivelines shall have quick disconnect slip clutches. Drivelines to the three gearboxes will be a minimum 35R size and type (ASAE Category 5, 46 HP at 540 RPM) size. The splitter gearbox end yoke shall have a spring tension lock coupler for quick attachment/removal to the splitter gearbox shafts. Spindle gearbox yoke shall be an interference bolt type. Quick connector yoke at splitter gearbox is not acceptable. Heavy duty self-adjusting two plate slip clutches (torque limiter) shall be installed before each of the three spindle gearboxes. Power take-off shaft and all drivelines shall be of one brand manufacture. Drivelines will allow a smooth transfer of torque during all modes and angles of operation of the mower. All universal joints and sliding tubes shall be equipped with grease zerks. All universal joints and drive shafts shall be completely covered with a non-rotating shield in compliance with OSHA regulations.

STRUCTURAL - Deck and wings a minimum of 7gauge, ASTM A-569 hot rolled carbon-manganese steel continuously welded top deck and reinforced with 7 gauge steel and ¼" ASTM A-500 hollow structural tubing to maintain integrity. Band or skirt will be 1/4" thickness with a minimum depth of 10 1/2" welded to the deck with a continuous weld. An under deck ring, 1/2" thick by 3" high by 48" in diameter, rolled from a continuous piece of flat steel shall be continuously welded, perpendicular to the bottom of the mower's deck. The ring shall be positioned so a blade would contact it just behind the blade cutting edge. The deck ring will provide reinforcement and protection of the deck. The mower shall have a draw bar tongue weight on the tractor of no more than 1550lbs.
The length of the center section of the mower shall be no longer than 92.5". All major pivot points on the mower shall include grease able and replaceable spring steel bushings with locking head pins that ensure that pivot points in the frame cannot wear.

BLADES AND RUNNERS - The blades shall be heavy-duty 1/2" x 4" SAE 5160 chrome steel suction type with breakaway feature. Blades may have a minimum 3" drop. Blades will be mounted with replaceable minimum 1 1/8" UNF hardened pentagon shaped blade bolts with 1 1/2" blade wear surface. A replaceable pentagon shaped blade bolt bushing shall be welded into the blade bar. Blades materials are to be tested in blade lots and should include these tests and processes: Minimum hardness test, ductility bend test, charpy v-notch impact strength test, surface carbon loss test, fatigue life test, microstructure purity inspection, material chemical analysis along with part # and lot code. The blades should also have: beneficial induced compressive surface stresses through shot-peening along with smoothed transitional surfaces around the blade bolt hole. The three gearbox spindles shall be equipped with heavily reinforced round dish (stump jumper) blade carrier. Carrier will be a dish that has a minimum ¼" thick steel pressed and spun with a minimum 30" diameter and 2 3/4" side height The blade bar in the carrier shall be made of 1" thick steel and two cross members shall be made of 3'8" thick steel both welded to the carrier dish. When installed the top lip of dish shall be no more than 4" from the bottom of the deck. The blade carrier shall be dynamically balanced to minimize vibration. Replaceable skid shoes on center and wing forward sections made of minimum ASTM A514 alloy steel shall be provided for protection in the event the tractor drops in a low place or ridges over a high point. The forward section of the wing skids are to be wider than the rear section as to prevent gouging and must also have the ability to be mounted outside or inside the side skirt. The Blades shall overlap 6 1/2". Mower shall be equipped with adjustable mechanical stops to prevent scalping when the mower is lowered to the cutting position. A system shall be provided to lock the center section and both wings in roading position. These lock up pin locations should be located in a raised position above the deck as to ease in finding them should the deck have debris on top. Transport locks shall be mechanical devices to remove all stress from the hydraulic cylinders and their mounts. A wheel transport mechanism for the wing wheels shall be incorporated into the center lock up so that when the center lock up pin is installed and the main cylinder is retracted the wing wheels are pulled inside of the wing sections to aid in an ultra narrow transport width.

CUTTING HEIGHT - Adjustable from 1.5" - 15".

HYDRAULICS - The mower shall utilize the tractor hydraulic system and have hydraulic cylinders to raise the wings and adjust the cutting height. The wing cylinders along with floating lugs shall allow for a minimum of 35 degree up and 25 degree down wing float during operation without pumping the hydraulics. Hydraulic cylinders shall be designed for 3,000 PSI operating pressure. All cylinder shafts will be nitro steel and re-build-able. The two hydraulic wing lift cylinders should each be 3" X 12" welded cylinders, 3" diameter bore, 12" stroke, 1.25" diameter rod, 22 ¼" closed pin center. A Hydraulic Phasing System shall be use to level the cutter from the center to the wing sections.This hydraulic phasing cylinder system shall consist of one 3 1/2" X 5" center cylinder, one 3 1/4" X 5" wing wheel standard cylinder and one other 3" X 5" wing wheel standard cylinder. Each phasing cylinder shall have 1 ¼" diameter rods, 18 1/8" closed pin center, rephasing orifices and mechanical stop collars fitted to all cylinders. Cylinder seals shall be as follows: Static and dynamic O-ring seals with nitrile 90 durometer, ASTM D2000, 86/SAE J200. Static and dynamic backup washers, unithane 395A, and liquid cast polyurethane. 3000-PSI series piston seal, 15% fiberglass filled Teflon piston seal c/w 90 durometer o-ring expander. 3000-PSI series piston and cylinder rod wear rings, #66 nylon, 33% glass filled. 3000-PSI series rod seal, #605 twin lip u-cup seal. Cylinder rod wipers seals, 3000-PSI series, metal encased nitrile lip wiper seal. Wings will be capable of flexing from 25° below horizontal to 90° above horizontal to follow any terrain. You should not include the hydraulic valves, which will be supplied on the tractors. All hoses (minimum 1/2" ID 2-wire non-skive) and quick couplings necessary for mounting on the tractor should be included. Safe guards shall be provided to stop the wings from raising to a point that would prevent it from being lowered from the operator's station. Mower shall have an A-Frame or similar support to protect the hoses between tractor and mower. The mower shall have a manually operated auxiliary winch to raise or lower each wing independently in case of hydraulic failure and lock up pins to secure the wings when roading. Hydraulics will meet SAE J517 and J232 requirements.

WHEELS, AXLES AND SUSPENSIONS - The mower shall be equipped with not less than six trail type laminated tires properly spaced for best weight distribution. The wheels will be mounted with a minimum of five lug bolts and the wheel hubs shall have roller bearings. Rear axle arrangement shall provide for two sets of two wheels each at center section, and a single wheel at each wing section. Main deck suspension shall be a walking beam-type rear suspension consisting of a main beam 5”X5” X .250 ASTM A-500 tubing material and wing wheel arms 4”X3”X .250 ASTM A-500 tubing material. The walking axle must be supported by two tapered roller bearings placed on both sides of the walking beam with a 1 3/8” lock head shaft running through. This walking axle suspension will be positioned as far forward as possible to best control cutter height over uneven ground. Outer wing wheel standards shall be equipped with a rubber gromlet for suspension and must include a threaded rod with adjusting nuts at the end of the phasing cylinder to allow to fine tune the height of the wings to the center section of the cutter.

HITCH - Towing hitch shall be a heavy-duty swivel precision clevis type providing easy maneuverability. Hitch shall be of adequate design to accommodate all angles and stress caused from roadside right-of-way mowing. The tongue will be "A" frame design. Twin leveling rods to balance the weight with built in floating front hitch to keep undo stress off the leveling rods

PARKING JACK - A heavy-duty retractable pin-on type hand operated screw type jack is to be furnished and installed on the tongue perpendicular to the ground with the mower set at a 6" mowing height to aid in attaching the mower to the tractor. A second mount for this jack shall be attached to the top of the mower deck to safely store it when not in use and not to interfere with mowing operation.

SAFETY - All guards and shields will meet SAEJ232 requirements. The mower shall have 3/8" safety chain guards to protect the area surrounding the mower from flying objects. A minimum 3/16" high strength aircraft cable shall be interlaced through the second to the lowest chain link. Unit will have wing transport locks.

COLOR - Color to be manufacturer's standard over a prime coat.

NOTE: Complete unit must be manufactured in accordance with the latest adopted OSHA or SAE Standards and amendments thereto.

The Missouri Highways and Transportation Commission reserves the right to waive technicalities and to reject any or all bids and no bid is final until formally accepted by the Commission.